6-25-1952

Test 475: McCormick Farmall Super M

The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: June 25 to July 2, 1952
Manufacturer: INTERNATIONAL HARVESTER CO., CHICAGO, ILLINOIS
Manufacturer's rating: 42.0 drawbar hp, 47.5 belt hp
(Maximum hp corrected to standard conditions)

NEBRASKA TRACTOR TEST NO. 475

McCORMICK FARMALL SUPER M

FUEL, OIL and TIME Gasoline octane No. ASTM 76 Research 82 (rating taken from oil company's typical inspection data); weight per gallon 6.071 lb **Oil** SAE 20 to motor 2.163 gal; drained from motor 1.804 gal **Total time motor was operated** 45 hours

CHASSIS Type tricycle **Serial No** F1947J **Tread width** rear 52" to 88" front 8⅜" to 17½" **Wheel Base** 89¼" **Hydraulic control system** driven by clutch **Advertised speeds mph** first 2⅞ second 3¾ third 5 fourth 6¾ fifth 16¾ reverse 3⅜ **Belt pulley** diam 11" face 7½" rpm 899 **Belt speed** 2588 fpm **Clutch** single plate dry disc operated by foot pedal **Seat** upholstered seat on conical spring with shock absorber **Brakes** double disc brakes operated by two foot pedals **Equalized** by locking two brake pedals together **Power take-off** standard type.

ENGINE Make International Harvester **Type** 4 cylinder vertical **Serial No** 2029 **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and Stroke** 4" x 5¼" **Rated rpm** 1450 **Compression ratio** 5.9 to 1 **Displacement** 264 cu in **Port Diameter Valves** inlet 1 19/32" exhaust 1 7/16" **Governor** variable speed centrifugal **Carburetor Size** 1¼" **Ignition System** battery **Starting System** 6 volt battery **Air Cleaner** oil washed wire mesh **Muffler** was used **Oil Filter** replaceable treated paper element **Cooling medium temperature control** thermostat and radiator shutters.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, and K were made with an operating setting of the carburetor (selected by the manufacturer) of 96.1% of maximum belt horsepower.

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST B—100% MAXIMUM LOAD—TWO HOURS								
46.26	1451	3.907	11.84	0.513	0.00	190	72	28.830
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR								
43.92	1450	3.657	12.01	0.505	0.00	199	85	28.850
TEST D—RATED LOAD—ONE HOUR								
41.33	1452	3.508	11.78	0.515	0.00	200	89	28.850
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
41.45	1455	3.533	11.73	0.517	...	199	90	.....
1.59	1575	1.527	1.04	5.830	...	199	90	.....
21.64	1510	2.481	8.72	0.696	...	202	91	.....
41.81	1352	3.489	11.98	0.507	...	205	92	.....
11.06	1543	2.006	5.51	1.101	...	193	93	.....
31.49	1472	2.940	10.71	0.567	...	200	94	.....
24.84	1485	2.663	9.33	0.651	0.00	200	92	28.850

TORQUE (at dynamometer)									
Eng RPM	1452	1369	1299	1227	1160	1064	991	923	845	770
Lb-ft	326.2	335.5	344.2	354.7	362.3	365.1	364.9	362.8	362.8	355.3

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST F—100% MAXIMUM LOAD—3rd Gear											
41.79	3192	4.91	1452	5.53	..... Not Recorded				191	81	28.830
TEST G—OPERATING MAXIMUM LOAD											
37.03	5676	2.45	1451	12.53	..... Not Recorded				164	92	28.900
39.81	4024	3.71	1453	7.11	..... Not Recorded				184	81	28.850
40.08	3054	4.92	1453	5.18	..... Not Recorded				200	80	28.840
39.66	2166	6.87	1453	3.89	..... Not Recorded				185	81	28.860
35.88	772	17.43	1457	0.67	..... Not Recorded				201	81	28.870
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
33.33	2520	4.96	1449	4.24	3.236	10.30	0.589	0.00	190	89	28.932
TEST J—OPERATING MAXIMUM LOAD—3rd Gear											
38.71	3092	4.69	1452	10.66	..... Not Recorded				194	98	28.900
TEST K—OPERATING MAXIMUM LOAD—3rd Gear											
33.59	3058	4.12	1453	15.46	..... Not Recorded				180	100	28.900

TIRES, WHEELS and WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast spoke	Cast spoke	Cast spoke
Liquid ballast	963 lb each	None	None
Added cast iron	700 lb each	None	None
Rear tires			
No. and size	Two 13-38	Two 13-38	Two 11-38
Ply	6	6	4
Air pressure	16 lb	12 lb	12 lb
Front wheels			
Type	Cast spoke	Cast spoke	Cast spoke
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 6.00-16	Two 6.00-16	Two 6.00-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	21½ inches	23 inches	20½ inches
Static weight			
Rear end	7083 lb	3758 lb	3559 lb
Front end	1667 lb	1670 lb	1654 lb
Total weight as tested with operator	8925 lb	5603 lb	5388 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	44.24	48.56
2. Observed maximum horsepower (tests F & B)	41.79	46.26
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings)	33.18	41.28

We, the undersigned, certify that this is a true and correct report of official tractor test No. 475.

L. F. LARSEN
Engineer in Charge

C. W. SMITH
F. D. YUNG
L. W. HURLBUT
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is held wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors, which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads of 20 minutes each: rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.